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Physical Origins of the Orientation Ratio in Recording Media

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Introduction: Recording media with a high orientation ratio (OR) are required for the next generations of high-density recording. OR is an anisotropy in the radial and tangential magnetic properties and is obtained by media growth on circumferentially textured substrates. Despite more than a decade of work, the physical mechanisms leading to OR remain unclear.

Methods and Materials: Grazing-incidence x-ray diffraction of thin film structures.

Results: This past year we have made significant progress understanding OR in modern media. We find that the circumferential texturing causes two effects in the CrX underlayer: a preferential alignment of the CrX(110) planes along both the tangential and radial directions and an anisotropic strain (radial lattice parameter > tangential). Both of these lead to a preferred orientation of the media c-axis along the tangential direction (due to lattice matching) and hence to the OR. The extent of OR depends on the detailed interactions of the initial media growth on the CrX underlayer and is still under investigation. Methods of quantifying the anisotropic strain and the preferred orientation of the CrX (110) and media c-axis were developed and have been used on a variety of IBM and vendor media.